PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 00101	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 02/11507	International filing date *(day/month/year)* 15.10.2002	Priority date *(day/month/year)* 15.10.2002
International Patent Classification (IPC) or both national classification and IPC G06T15/40		
Applicant NOKIA CORPORATION et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 1 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
14.04.2004	26.10.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Klemencic, A Telephone No. +49 89 2399-6007

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 02/11507

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-26	as originally filed

Claims, Numbers

1-16, 19-26	as originally filed
17, 18	received on 09.10.2004 with letter of 06.10.2004

Drawings, Sheets

1/7-7/7	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-26
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-26
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the same documents as in the first communication:

D1: Han-Ming Chen et al.: The Feudal Priority Algorithm On Hidden-Surface Removal, Computer Graphics Proceedings 1996 (SIGGRAPH). New Orleans, Aug. 4 - 9, 1996, (1996-08-04), pages 55-64

D2: El-Sana J. et al., Efficiently computing and updating triangle strips for real-time rendering, Computer Aided design, Vol. 32, No. 13, pp. 753-772, November 2000

2 **Technical field**: Construction of triangle strips considering hidden surface removal.

3 **Independent claims**: 1, 9, 22 (a method), 16, 26 (an apparatus)

4 **Closest prior art**: Document **D1** discloses an example of a hidden surface removal method, where in the pre-processing phase all polygons (triangles) of an object are ordered in a rendering priority tree. A simple rendering task is left for a post-processing phase when the viewpoint or view direction is changed.

5 **Problem**: Organize triangles in a manner to improve the data transfer rate, compression and rendering efficiency.

6 **Solution**: Assemble the neighbouring triangles in triangle strips with the hidden surfaces already removed.

7 **Novelty**: Document **D1** does not disclose or hint at triangle strips and handles individual triangles independently.

8 **Inventive step**: Triangle strips are known and commonly used in graphics accelerators (see **D2**). However, they are constructed independently from hidden surface removal. In the invention the inclusion of each triangle in a strip depends on the hidden surface removal condition. Joining these two otherwise known techniques and especially joining them in a particular manner as described in the application, is not hinted at or obvious to the skilled person.

9 **Other aspects**: The core issue for the novelty, inventive step and even unity of

the application is whether the data file containing the triangle strips with removed hidden surfaces is novel and inventive or not.

In the first communication it has been argued that a simple juxtaposition of a hidden surface removal and a triangle stripping method would lead to identical data file as the one obtained by the method of claim 1. However, the argument of the applicant, given in reply (page 2, lines 1-6) is accepted and the data file itself is now considered to be novel and inventive.

The consequences of that decision are twofold:

a) A method for displaying object files (claims 9 to 15) and apparatus claims (16 to 21) are also considered novel and inventive, because the data file represents the link between two independent methods (i.e. inventions) of claims 1 and 9 and the apparatus claim 16, referring to a mobile communication terminal displaying the contents of the data file.

b) A method for culling vertices with respect to symmetry planes is unitary with the rest of the claims, as long as it is explicitly stated that the data file is produced by the method of claim 1 (or any subsequent claims 2 to 8). In that case the data file represents the link between the two independent methods (i.e. inventions) of claims 1 and 22.

10 **Clarity, Article 6 PCT**

10.1 In claim 16 it should have been explicitly stated that the 'object files containing triangle strips' have been generated by a method of claim 1. Thus a link between both independent method claims would have been established.

10.2 In claim 22 it should have been explicitly stated that the 'data defining triangle primitives' has been generated by a method of claim 1. Thus a link between both independent method claims would have been established.

Preferably, independent claim 22 could have been formulated as a dependent claim, depending on claim 1, introducing the steps a) to f) as additional steps of the method of claim 1. Thus the number of independent claims would also have been reduced and conciseness of the application would have been increased (Article 6 PCT).

10.3 In claim 26 it should have been explicitly stated that 'three-dimensional objects' have been generated by method of claim 1, to establish the link to inventive data file. Without such a reference any other known 3D object data could have been used, rendering the device trivial i.e. non-inventive.

Preferably, independent claim 26 could have been formulated as a dependent claim, depending on claim 16, and introducing additional features ('storing planes of symmetry', 'mirroring vertex data'). Thus the number of independent claims would also have been reduced and conciseness of the application would have been increased (Article 6 PCT).

10.4 Minor editorial errors, which could have been avoided:

a) page 9, line 4: claim 8 => claim 9

b) page 22, line 11: step 55 => step 60

c) Fig.4.: some reference numbers are probably not correct.
- the entrance box [55:Fig.2] => [50:Fig.2]
- the box after step 87 [60:Fig.2] => [55:Fig.2]

d) Fig.2: a link from step 52 back to 50 (corresponding to the box after step 84 in Fig.4, i.e. division into two new objects) is probably missing.

11 General remarks

11.1 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in document **D1** and **D2** is not mentioned in the description, nor is this document identified therein.

11.2 Independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT. In addition, the applicant should ensure that it is clear from the description which features of the subject-matter of claims are already known in combination from the document **D1** (see the PCT Guidelines, III-2.3a).

11.3 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

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~~corresponds to the order in which triangle strips are stored in the object files.~~

17. A mobile communication terminal according to claim 16, wherein the triangles in the triangle strips are displayed in the same order as they were added to the strip, which preferably corresponds to the order in which they are stored in the triangle strips.

18. A mobile communication terminal according to claim 16 or 17, wherein a rendering order of said objects is determined using a binary space partitioning method.

~~19. A mobile communication~~ terminal according to any of claims 16 to 18, comprising means for culling all triangles facing backwards relative to the viewing direction.

20. A mobile communication terminal according to any of claims 16 to 19, further comprising means for retrieving planes of symmetry stored in the object file, and means for duplicating all vertex data present in the object file and flipping the sign of the vertex values on the axis orthogonal to the respective plane of symmetry for the newly created triangles.

21. A mobile communication terminal according to any of claims 16 to 21, in which the image rendering process is carried out by the main CPU of the device, and all further image rendering means is software embedded.

22. A method of preparing on a first device object files used for rendering two-dimensional images of three-dimensional objects on a second device by processing data ~~defining triangle primitives representing at least one~~